

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-13 (Cancelled).

14 (New): A method for the attachment or self-organization of biological macromolecules, or both, comprising:

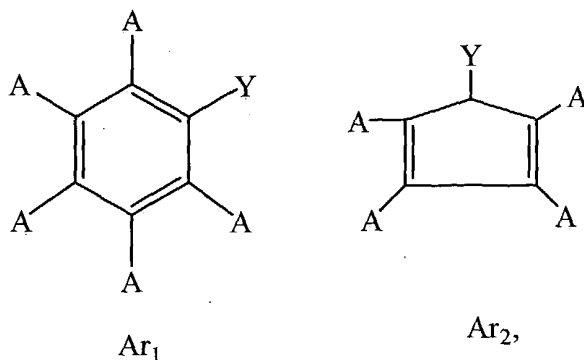
incubating, without stirring, for at least 15 minutes, a biological macromolecule in solution with nanotubes of carbon closed at their ends, under suitable temperature and pH conditions, wherein said nanotubes of carbon are functionalized by physical adsorption at their surface with a chemical reagent of general formula H-E-L,

in which:

H is selected from the group consisting of a positively charged hydrophilic group, a negatively charged hydrophilic group, a ligand of a biological macromolecule, an analogue of a biological macromolecule, an organometallic complex that interacts with an amino acid, and an organometallic complex that interacts with a nucleic acid, wherein said ligand is optionally functionalized with alkyl groups for bonding to E;

E represents a spacer arm, selected from C₁-C₁₀ carbon chains, which may be optionally substituted with alkyl groups or otherwise, having unsaturations or polyoxyethylene units which may have or otherwise in the middle of the chain phosphate groups,

L represents a lipid unit with one or more chains of variable length, in the form of C₁₂-C₂₀ having unsaturation or otherwise; an aromatic group of formula Ar₁ or of formula Ar₂:



in which:

A represents a hydrogen atom, one of the following groups: alkyl, CF₃, NO₂, NH₂, OH, O-alkyl, S-alkyl, COOH, halogen, an aromatic ring or an aromatic heterocycle in the form of C₄-C₆, optionally polysubstituted with electron-donating groups of the alkyl type or electron-attracting groups of the CF₃ or halide type; and

Y represents a bond with L.

15 (New): The method according to Claim 14, wherein said biological macromolecules are selected from the group consisting of soluble membrane proteins, soluble transmembrane proteins, enzymes, antibodies, antibody fragments and nucleic acids.

16 (New): The method according to Claim 14, wherein said solution comprises an aqueous or aqueous-alcoholic solvent, which optionally contains at least one detergent.

17 (New): The method according to Claim 14, wherein incubation occurs at room temperature for 15 minutes to 48 hours, at a pH of between 5.5 and 8.5.

Appl. No.: New Application

18 (New): A bioanomaterial comprising nanotubes of carbon on which biological macromolecules are self-organized in a crystalline form, which is produced by the method of Claim 14.

19 (New): A method for the structural study of a biological macromolecule comprising the analysis of the structure of the biological macromolecules self-organized in crystalline form in the bionanomaterial of Claim 18.

20 (New): A biological reagent comprising the bionanomaterial according to Claim 18.

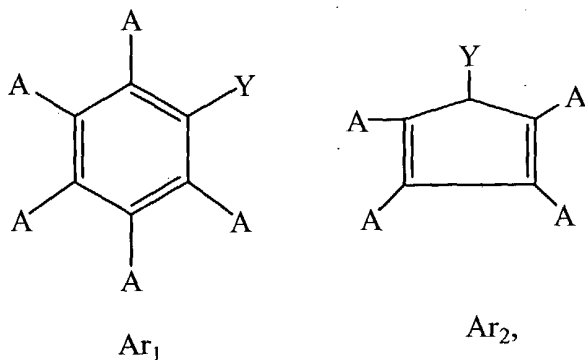
21 (New): A biosensor or bioconductor comprising the bionanomaterial of Claim 18.

22 (New): A chemical reagent which may be physically adsorbed on nanotubes of carbon, having the general formula H-E-L, in which:

H is selected from the group consisting of a positively charged hydrophilic group, a negatively charged hydrophilic group, a ligand of a biological macromolecule, an analogue of a biological macromolecule, an organometallic complex that interacts with an amino acid, and an organometallic complex that interacts with a nucleic acid, wherein said ligand is optionally functionalized with alkyl groups for bonding to E;

E represents a spacer arm, selected from C₁-C₁₀ carbon chains, which may be optionally substituted with alkyl groups or otherwise, having unsaturations or polyoxyethylene units which may have or otherwise in the middle of the chain phosphate groups,

L represents an aromatic group of formula Ar₁ or of formula Ar₂:

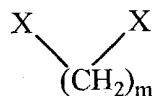


in which:

A is a hydrogen atom, alkyl, CF₃, NO₂, NH₂, OH, O-alkyl, S-alkyl, COOH, halogen, an aromatic ring or an aromatic heterocycle in the form of C₄-C₆, wherein said rings may be optionally polysubstituted with electron-donating groups of the alkyl type or electron-attracting groups of the CF₃ or halide type; and

Y represents a bond with E.

Claim 23 (New) The reagent of Claim 22, wherein E comprises

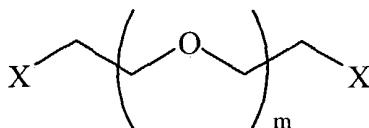


in which:

m represents an integer from 1 to 10,

X represents O, NHCO, OCO, COO, CONH, S, CH₂ or NH and constitutes, at the ends of the said carbon chain, an organic function for the adhesion of an ester, amide, ether or thioether type.

Claim 24 (New) The reagent of Claim 22, wherein E comprises

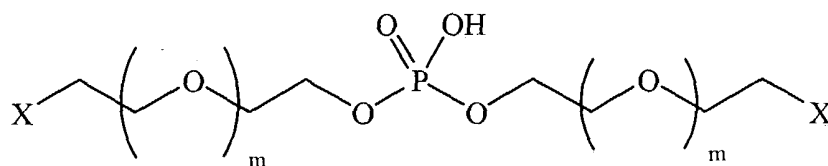


in which:

m represents an integer from 1 to 10,

X represents O, NHCO, OCO, COO, CONH, S, CH₂ or NH and constitutes, at the ends of the said carbon chain, an organic function for the adhesion of an ester, amide, ether or thioether type.

Claim 25 (New) The reagent of Claim 22, wherein E comprises



in which:

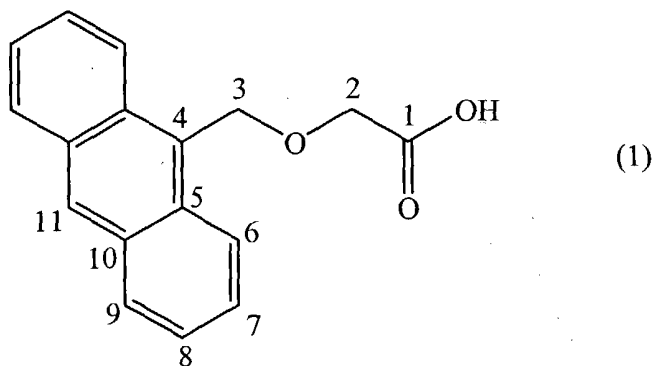
m represents an integer from 1 to 10,

X represents O, NHCO, OCO, COO, CONH, S, CH₂ or NH and constitutes, at the ends of the said carbon chain, an organic function for the adhesion of an ester, amide, ether or thioether type.

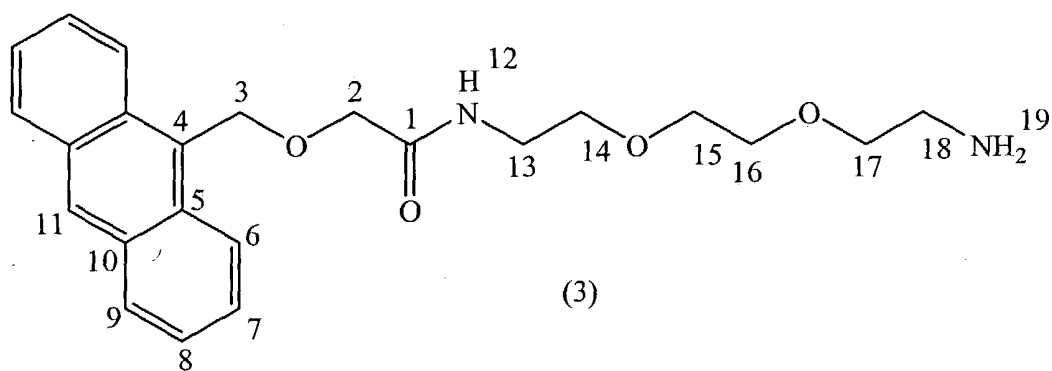
Claim 26 (New) The reagent of Claim 22, wherein L is a group of the formula Ar₁.

Claim 27 (New) The reagent of Claim 22, wherein L is a group of the formula Ar₂.

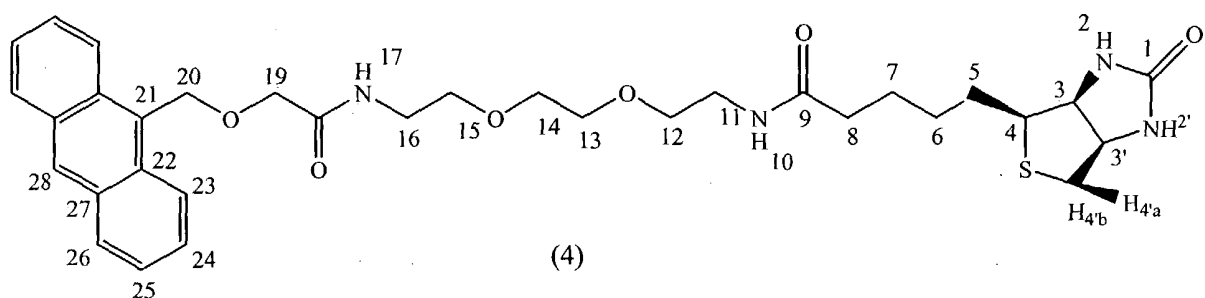
Claim 28 (New): The chemical reagent according to Claim 22, which has the following structure:



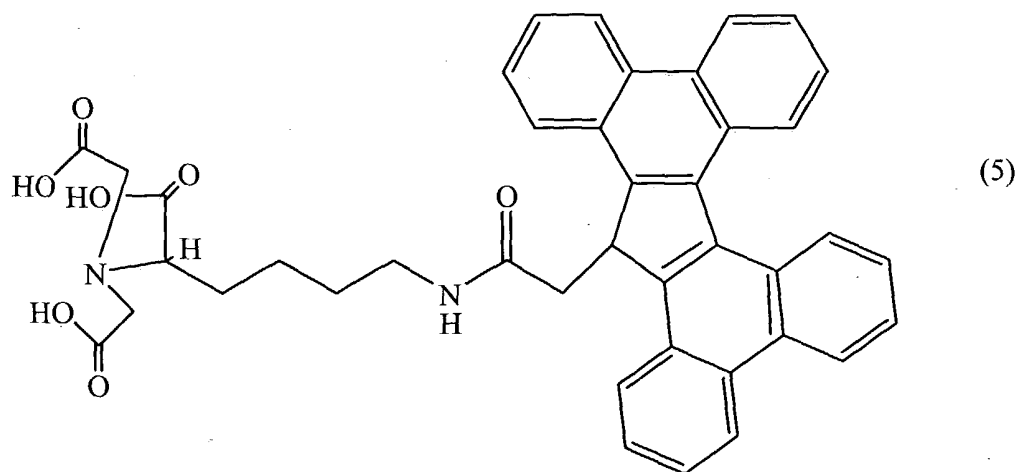
Claim 29 (New): The chemical reagent according to Claim 22, which has the following structure:



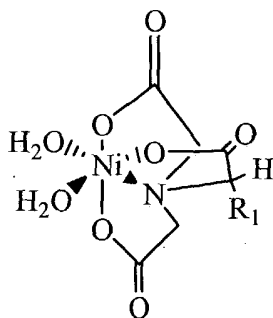
Claim 30 (New): The chemical reagent according to Claim 22, which has the following structure:



Claim 31 (New): The chemical reagent according to Claim 22, which has the following structure:



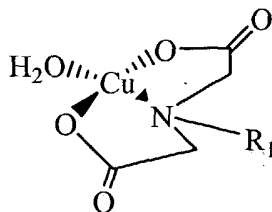
Claim 32 (New): A chemical reagent according to Claim 22, wherein H is:



Ni-NTA complex

wherein R_1 is an organic group suitable for bonding to E.

Claim 33 (New): A chemical reagent according to Claim 22, wherein H is:



Cu-IDA complex

wherein R_1 is an organic group suitable for bonding to E.